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ABSTRACT

The Mozart effect involves the enhancement of spatial processing after listening to a Mozart piano sonata (Rauscher, Dhaw, and Ky, 1993). Efforts to replicate the Mozart effect have been mixed, possibly due to differences in dependent variable operationalization across studies or large individual differences in magnitude of effect. Chabria and Kosslyn (1998) found that coordinate spatial processing was mediated by the right cerebral hemisphere, while the left hemisphere mediated categorical spatial processing, and that these processes could be affected by hemispheric bias in the projection of task-relevant information through the use of colored filters. The present study (conducted with 36 undergraduate students with less than two years of musical training) tested whether presentation of spatial task items on red versus green backgrounds could influence the Mozart effect as measured with a paper folding and cutting task. The use of the filters had no reliable effect on performance. (Contains 10 references.) (Author/BT)

# A Test For Lateralization of the Mozart Effect

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Abstract

The Mozart effect involves the enhancement of spatial processing after listening to a Mozart piano sonata (Rauscher, Shaw, and Ky 1993). Efforts to replicate the Mozart effect have been mixed, possibly due to differences in dependent variable operationalization across studies or large individual differences in magnitude of effect. Chabris and Kosslyn (1998) found that coordinate spatial processing was mediated by the right cerebral hemisphere, while the left hemisphere mediated categorical spatial processing, and that these processes could be affected by hemispheric bias in the projection of task-relevant information through the use of colored filters. The present study tested whether presentation of spatial task items on red versus green backgrounds could influence the Mozart effect as measured with a paper folding and cutting task. The use of the filters had no reliable effect on performance.

In 1993, Rauscher, Shaw, and Ky reported that spatial processing was enhanced after listening to Mozart's Sonata for Two Pianos in D major (K448). Rauscher et al. produced the Mozart effect by first exposing their subjects to the sonata and then testing the spatial I.Q.s of the subjects. Of the many attempts to replicate this effect, several have been successful. In 1996, Rideout and Laubach found that spatial performance was significantly improved after exposure to Mozart in the context of a study of EEG correlates of the performance change. Rideout and Taylor (1997) also found a small but significant effect . Similarly, Rideout, Dougherty, and Wernert (1998) found a reliable improvement in spatial performance after listening to Mozart and also after a similar piece of modern music by the artist Yanni.

In another attempt to confirm the existence of the Mozart effect, Nantais and Schellenberg (1999) came to noteworthy conclusion. They found that Mozart enhanced spatial performance when the control condition was silence prior to a spatial task, but that no effect was present when a narrated story was the control condition. They concluded that the Mozart effect is a function of preference. Better performance followed the preferred condition, music or story.

Many other researchers have found results contrary to Rauscher et al. (1993). Steele, Brown, and Stoecker (1999) found no reliable effect in their study in which they attempted to produce the Mozart effect and recover it after the presentation of a verbal distracter. Steele, Bass, and Crook (1999) also failed to replicate the Mozart effect. The most recent failure to replicate was made by McCutcheon (2000).

In a meta-analysis of studies of Mozart's effect on performance, Chabris (1999) states that the effect is very small and is isolated to only certain types of tasks. Many attempts to replicate may have failed due to inappropriate dependent measures or other procedural variations. A more reliable test of the Mozart effect is needed to confirm its existence.

One might assume that the spatial tasks enhanced by the Mozart effect are mediated by the right cerebral hemisphere. Chabris & Kosslyn (1998) point out, however, that while the right hemisphere processes coordinate spatial tasks, the left hemisphere mediates categorical spatial tasks. A spatial task may thus involve right and/or left hemisphere activity, and may also involve a shift from right to left as performance efficiency increases, as the authors point out. Due to the differential projection of the visual magnocellular and parvocellular fibers to the two hemispheres of the brain, color filters can be used to bias projection of task-relevant stimulus materials to one hemisphere or the other, thereby influencing performance. The color red was found to suppress right hemisphere coordinate spatial processing, while the color green was found to suppress left hemisphere categorical spatial processing (Chabris & Kosslyn, 1998). If the Mozart effect is due to enhanced right hemisphere activation from listening to music, differential suppression of hemispheric projection by means of color filters would be expected to influence the emergence of the effect. Therefore, spatial tasks presented on a green background would be more easily influenced by the presentation of the Mozart piano sonata. In this study, it was hypothesized that subjects who listened to Mozart and were presented spatial tasks on a green background would perform better than those tested on the red background.

## Method

### Participants

Thirty-six undergraduate students (18 male, 18 female), ages ranging from 18-22 years old volunteered to be in the study. All of the students had two years or less of musical training and none of the students was given compensation for participation.

Procedure

First, the students listened to Mozart's Sonata for Two Pianos in D Major (K448) for approximately 10 minutes. They then orally responded to 16 paper folding and cutting tasks, as used in previous studies (e.g., Rideout & Taylor, 1997). These tasks were projected onto a screen from an overhead projector with either a red or a green filter. Half of the participants were present with tasks on a green background, while the tasks of the other half were presented on a red background. The subjects were given 40 seconds to respond to each item, with a 5 second warning before the end of the response time. The participants then answered 3 subjective questions, rating the music on a scale of 0-10 for enjoyment, familiarity, and complexity.

## Results

Analysis of the data showed no reliable difference ($t = .33$) between the performance of the subjects (number scored correct) with tasks presented on the green (mean 9.39, SD 2.85) versus the red background (mean 9.06, SD 2.93). Previous data, without controlling for color found a control mean of 10.78 (SD 3.47) and experimental mean of 11.84 (SD 2.89) (Rideout & Taylor, 1997).

## Discussion

The lack of a reliable difference between the two groups suggests that the Mozart effect previously seen with the current spatial task and procedure is not due to simple enhancement of right hemisphere activation. Any bias in hemispheric projection due to the use of color filters clearly had no differential effect on performance. However, the level of performance by both treatment groups presents a new problem, since comparison to past data shows means for the red

and green groups that were both significantly smaller that the control and experimental values for past studies. Suppression of performance could be due to participant sample differences across studies, or due to reduced brightness of the display, which may have increased task difficulty slightly. It may also be that the task involves both hemispheres in an integrated way, and that the musical stimulus enhances this integration. The effect of reduced brightness is currently being investigated, along with the further testing of subjects under the same control procedure used in previous studies in this laboratory.

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